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VITAMIN D AND THE ATHLETE

Introduction

The world of the Athlete abounds with nutritional supplements and a basic understanding of their value, yet there is a rising trend of deficiency in athletes in regards to vitamin D. The sunshine vitamin is one of the most misunderstood, and underestimated micronutrients. Decades of studies about Vitamin D have shown it to be beneficial to the athlete in a variety of ways, including, but not limited to, speed enhancement, prevention of stress fractures, increased protein synthesis, preservation of muscle strength, overall bone density, and exercise-related inflammation immunity.

Who is Deficient and Why

Vitamin D is available through three sources: direct sunlight exposure (UVB), food, and supplementation. The most significant of these sources, and most bio-available, is direct sunlight. Because of this, it might seem that indoor athletes are most at risk of Vitamin D deficiency, when in fact, outdoor athletes have a high rate of deficiency as well, due to the use of sunscreen and full-coverage/protective clothing. The simple wearing of sunscreen with a sun protection factor of 30 reduces vitamin D synthesis in the skin by more than 95%.[9] The main cause of vitamin D deficiency in the athletic population is the direct result of decreased ultraviolet B (UVB) radiation absorption into the skin; therefore there is a concomitant decrease in the cutaneous synthesis of vitamin D.[1]

In addition to reduced availability through sunlight due to deliberate reduction of UVB exposure, fat malabsorption conditions also contribute to an athlete's risk of vitamin D deficiency. Because vitamin D is a fat-soluble nutrient, the presence of fat is required for absorption. These fat malabsorption conditions include Crohn's Disease, Celiac and Cystic Fibrosis.[4,9]

A further aspect of increased risk of vitamin D deficiency can be found in skin pigment. Large amounts of the pigment melanin in the epidermal layer result in darker skin and reduce the skin's ability to produce vitamin D from sunlight.[3,9]

Vitamin D insufficiency affects almost 50% of the population worldwide. It is suggested to measure the serum 25-hydroxyvitamin D [25(OH)D] level as the initial diagnostic test in individuals at risk for deficiency.[9] Because of the escalated metabolic activity found in athletes, it is important that they be screened to determine deficiency risk. Additionally, direct sun exposure contributing to adipose levels of vitamin D can vary greatly from season to season, as well as be subject to conditions of pollution, latitude, and atmospheric ozone. These variances suggest that athletes should reassess their levels regularly.[1]

Sources of Vitamin D

The availability of vitamin D through food sources is exceedingly limited, and is more efficiently gained through direct sun-exposure and oral supplementation. Direct sun-exposure should be limited to 5-30 minutes twice per day between the hours of 10am and 3pm. Current safe upper limits for supplementation is set at 4,000 IU by the National Institute of Health, but there are newer data supporting upper limits as high as 10,000 IU per day.[2]

Food sources of vitamin D (unfortified, naturally occurring) [2,6]

Cod Liver Oil	1 Tbsp	1360 IU
Swordfish, cooked	3 oz	566 IU
Salmon, wild, cooked	3.5 oz	981 IU
Salmon, farmed, cooked	3.5 oz	249 IU
Liver, beef, cooked	3 oz	42 IU
Egg, 1 large	1 whole egg	18 IU

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The Dangers of Deficiency

Because of the health issues associated with vitamin D deficiency, it is imperative to make every effort to achieve acceptable levels of vitamin D in athletes. Sports Medicine practitioners should strive to aggressively treat this deficiency, for the well-being of the athlete. Vitamin D is a fat-soluble nutrient, and as such presents the potential for toxicity, though the likelihood of such an event is exceptionally low and would require an estimated vitamin D intake of 100,000 IU/day for several months. [6]

Health Issues Associated with Vitamin D Deficiency [7,8]

- Stress fractures
- Chronic musculoskeletal pain
- Viral respiratory tract infections
- Malignancies (cancer)
- Arthritis
- Diabetes
- Inflammatory bowel disease
- Multiple sclerosis
- Metabolic syndrome
- Hypertension

The Benefits of Optimum Levels of Vitamin D to the Athlete [1,5,6]

While there is limited current data regarding vitamin D and athletic performance, there is ample evidence to suggest that obtaining adequate vitamin D intake can strengthen the immune system, speed recovery from intense exercise (with a direct impact on inflammation), and increase muscular power and force. Other benefits, as deduced from prevalent research include: improved reaction time, improved muscle preservation, improved balance and coordination, improved endurance, reduction in susceptibility to chronic illness / disease / conditions, and reduction in muscle injury with a correlating reduction in length of healing time.

A Question of Doping

Because activated vitamin D is a secosteroid hormone, questions may arise if use of its precursor, vitamin D, constitutes an unfair advantage, “doping, so to speak,” as the Germans noted in 1940. However, unlike testosterone or growth hormone, vitamin D deficiency is probably common among athletes. Furthermore, untreated vitamin D deficiency is associated with numerous serious illnesses and is a risk factor for early death. Withholding vitamin D in vitamin D-deficient athletes seems to violate most rules of modern medical ethics and may expose the sports medicine physician to needless future liability. [1]

How Much Vitamin D is Optimum

Studies have been consistent in stating that less than 20 ng/mL (blood serum concentration of 25(OH)D) is considered dangerously deficient. The treatment of an athlete should begin with an appropriate assessment of the vitamin D level, and especially in regard to outdoor athletes, this level should be reassessed seasonally. The best measure is the serum concentration of the inactive 25(OH)D3 level; this represents the vitamin D level from dietary intake, sunlight exposure, and adipose stores. Recent studies have recommended a normal range between 30 and 50 ng/mL; serum concentrations below this value stimulate the production of parathyroid hormone. Additionally, optimal calcium absorption requires at least 30 ng/mL of vitamin D in adults. [5]

Conclusion

Athletes, regardless of sport and orientation (indoor/outdoor) should be screened to ascertain current vitamin D levels, and reassess seasonally. Strong evidence exist that oral

supplementation of vitamin D to direct sunlight exposure and food sources is both intelligent practice and potentially lifesaving.

While there are no guidelines for ideal vitamin D levels in athletes, there is ample data to suggest that increasing vitamin D levels to 30 ng/mL – 50 ng/mL will improve health and, at the least, potentially contribute to enhanced performance.

References:

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